

each side of the bed to restrain him—that the pulse could not be counted. There was no oedema or inflammation about the wound. The hands and feet were cold, the ends of the fingers were of a dark blue colour; the blood appeared to be stagnating in his limbs. The pupils were widely dilated, and there was left divergent strabismus. He continued unconscious, tossing about the bed until shortly before his death at 11 o'clock the same evening. Capillary tubes charged with blood taken from the ear at 5.30 P.M., when cultivated on gelatine, developed the bacillus anthracis abundantly.

On examination of the body forty-five hours after death there was much dark discoloration of the skin over and above the clavicle on the right side. The veins were very noticeable on both arms and sides of the chest. The finger nails were a dark colour, but the toes were natural in appearance. On opening the chest fluid was found in both pleural spaces. The pericardium contained an ounce and a-half of serum. The heart muscle was dark-coloured, and contained no clots. The valves were normal. The liver, kidneys, and spleen were engorged, and heavier than usual. On removing the calvarium and dura mater the brain was covered with blood effused between the arachnoid and pia mater, extending also round to the base but not into the ventricles. The brain appeared natural. Anthrax bacilli were numerous in the pleural and peritoneal fluids.

THE DANGER OF ANTHRAX FROM THE MANIPULATION OF HORSEHAIR, AND ITS PREVENTION.

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MODE OF INFECTION.

SOME time ago, as certifying factory surgeon, I had to report on a fatal case of anthrax, and while making my investigation I was deeply interested in the diagnosis, the genesis, and the prophylaxis of that dreaded disease. The notification of anthrax is obligatory, but on reviewing the literature on the subject, I was convinced that some cases, especially of the so-called internal type, were never recognised.

History.—I. C., aged 24, who had always enjoyed good health, was employed as a duster or cleaner in a showroom of a cabinetmaker's warehouse. On the morning of September 13th, 1900, she had a distinct rigor, and for 48 hours suffered from general *malaise*, headache, and vomiting. This was followed by swelling of the left cheek and the development of a boil or pimple below the malar bone. The forewoman assured me that she had observed this pimple three days before the girl had the rigor. On September 17th the swelling, which was now hard, brawny, and intensely painful, had increased to an alarming extent. On September 20th she complained of intense pain in the epigastrium and abdomen, and next morning she was removed to Belvidere Hospital, where she died three hours after admission, on the tenth day of her illness.

Progress.—(For the following notes I am indebted to Dr. J. C. McClure, Senior Assistant, Belvidere Hospital). Since the onset of her illness, the patient had suffered from sickness, vomiting, and ever-increasing pain. On admission the girl was collapsed; temperature normal; pulse practically uncountable; and respirations sighing. The pustule on the left cheek had increased in size till now it measured $2\frac{1}{2}$ inches across. Scrapings of the pustule during life showed typical anthrax bacilli.

Post-mortem Examination.—Within 24 hours after death a post-mortem examination was made, and cultures of anthrax bacilli were obtained from pericardial fluid, ascitic fluid, spleen, and heart muscle. Malignant pustules of large size were found in the stomach, while numerous smaller ones were found in the intestines. It is interesting to note in connection with the presence of these pustules in the stomach and intestines that her brother voluntarily stated that the patient was in the habit of chewing hair.

This direct inoculation of the mucous membrane was a new phase of the disease, so unlike that produced by the digestion of infected meat that I was led to make further inquiry. The nature of the woman's work when sweeping the floor and dusting the furniture caused the air to be impregnated not only with dust, but also with small pieces of hair, and the forewoman declared that she had frequently seen such bits of hair adhering to the lips and angles of the mouth of the deceased, and that these were nipped by her incisors. This, I think, explains the brother's statement.

When endeavouring to trace the source of the infection I was permitted, through the courtesy of the employers, to examine their workroom journal, and learned that from September 1st consignments of hair had been received on the following dates: September 3rd, 7th, 8th, and 10th; but as

to the original source of the hair I could get no information. The period of incubation in anthrax cannot be definitely stated, for it varies under certain conditions; the bacillus acts much more quickly than the dried spore, and in the form of inoculation it depends entirely on the receptive condition of the abraded surface. Bearing in mind then that the eschar was first noticed on the woman's cheek on September 9th, we may safely assume that the bale received on September 3rd was the one which carried the poison. All the hair received on the dates mentioned had been supplied by one firm, at whose factory I learned that two of their employees had suffered from anthrax. One woman had died suddenly on September 4th, and on bacteriological examination of her blood it was found to teem with anthrax bacilli. The other case recovered.

Owing to the veterinary regulations of our public slaughterhouses, the dangers from anthrax in native hair—which is chiefly used in this factory—are almost precluded, and in nearly every case the source of infection has been traced to Chinese, Russian, or Siberian hair.

About August 24th this firm had received a consignment of hair from Russia, which had been sent in bales, uncovered, and bound together with cords. To carry these into the factory the carter hoisted them on his shoulder, while the next to actually handle this hair was the unfortunate woman. Both were apparently infected about the same time. The life of the carter was saved by an operation on September 8th, but the poor woman, whose wretched habits and environment had greatly reduced her vitality, succumbed on September 4th. After being prepared, this suspected bale was mixed with other hair and despatched on September 3rd to the cabinetmaker's workshop; but it still carried with it the living and virulent germs, and I. C. was the next victim. It has now been used in stuffing mattresses, and unless these germs be finally annihilated—say by some beneficent fire—they may go forth once more to slaughter the innocent. No animal plague is so widespread, no disease is more far-reaching and dangerous in its results, and no disease is in its etiology so true to the physical condition of germ-laden dust.

In 1878-9 Dr. Russell, in a report to the Local Government Board, described 9 cases of illness, 5 of which were fatal, in horsehair factories in Glasgow. These were definitely ascertained by bacteriological examination to be due to anthrax, and in all these cases the infection was conveyed by Russian hair. The danger arising from the dust and dirt of foreign hair is so great that many persons not actually connected with these factories have been infected with the disease. Dr. Kübler, in his report on this disease to the German Imperial Health Office, states that between 1834 and 1888 two women had died of the disease who had mended the clothes of their husbands who were engaged in horsehair factories; that the mother of a workwoman had died of malignant pustule on the neck from having worn the scarf of her daughter, who had worn it round her neck at work in a hair factory; that a man engaged in using, as a manure, dust from a horsehair factory, developed a pustule on the arm; that in 1897 a man died at Nuremberg of internal anthrax who had associated much with brushworkers, and had regularly taken his meals with them, but had never been in a horsehair factory; that cases of anthrax had occurred among cattle in the neighbourhood of horsehair factories, and on such farms as had used hair refuse as manure. In his last report on anthrax, the Medical Inspector of Factories states that "the number of cases reported in 1899 is double that of 1898, and is due very largely to special incidence on the horsehair industry, which has not been observed in previous years." He also states that in the previous years cases had occurred which had not been reported. Certainly it is the case that the bacilli are sometimes so numerous in the poisoned blood as to interfere with the motions of the red corpuscles, and to prevent their forming rouleaux, and even give rise to hæmorrhages; but it is a curious fact that in the gastric or pneumonic variety of the malady no large development of these organisms seems to occur till just before or just after death. Further, it has been observed in the pustular form of the affection that while bacilli may be present in the serum of the vesicle, they may be entirely absent from the blood taken at its base. It may be assumed, then, that an early

diagnosis is by no means an easy matter, unless the history points definitely to infection in the occupation of the patient.

In these factories the germs of anthrax can only be conveyed by the hairs of animals that have died of the disease, or have been contaminated with blood or discharges from such animals. The process of sorting simply pollutes the air with germ-laden dust; while the hands of the workers and other exposed parts get covered with the dirt from the hair.

PREVENTION.

In the prevention of the disease there are three main points to contend against: (1) The dust arising from the dry hairs; (2) the contaminated discharges which adhere to the hairs; and (3) the germs—bacilli and spores—of the disease.

1. *The Dust.*—The germs are more easily disseminated in the dry state; hence if the hairs could be moistened at a temperature either high enough to destroy them, or low enough to prevent cultivation, the danger could only arise from actual contact on an abraded surface.

2. *The Discharges.*—These contain the spores, and are agglutinated to the hairs, from which it is almost impossible to separate them. This appears to me to be a most serious difficulty in the way of disinfection, for no mechanical appliance seems to be efficient in extracting them satisfactorily.

3. *The Germs.*—With the bacillus there is little or no difficulty, inasmuch as when it is exposed to a temperature of 50° C. for ten minutes it is destroyed. On the other hand, the spore in the dried state is the most resistant of known organisms. It can retain its vitality in a temperature long after the fabric to which it is attached has been absolutely burned, and can only be destroyed by strong germicides, continued boiling, or steam at a very high pressure. The power of growth may remain for many years. In the report by Dr. Russell, to which I have already referred, he writes (p. 328): "I think it is the same writer (Rayer) who records the still more remarkable case of three persons who were attacked with the disease after cleaning some hair that had for many years served as stuffing of an easy chair." Further, the factory people declared that the hair which I suspected could not carry infection, inasmuch as it had been (1) boiled in dye for two hours, (2) boiled in copperas for one hour, and (3) stoved at a temperature of 150° to 186° F. for forty-eight hours. Dr. Kübler found the spores capable of development after three hours boiling, and Koch found that they retained their vitality for ten days in a 5 per cent. solution of copper sulphate.

In the prevention of anthrax in this industry there are two main considerations to be kept in view, first, that the means used are sufficient to absolutely destroy these resistant spores, and, secondly, that the commercial value of the raw material is not reduced thereby. Koch, in his work published in 1881, writes: "In practice, for disinfection of anthrax only such means are worthy of notice as can destroy all germs of organic life within twenty-four hours." In his experiments at the German Imperial Health Office, and after having failed with formalin and oil of turpentine, Dr. Kübler declares that current steam is a trustworthy means of disinfection, but it requires to be applied under pressure, and this excessive pressure causes the ends of the hairs to curl up, to lose their elasticity, and become brittle, so that there is considerable loss of material when put through the "willey." This high pressure also causes white hair to become yellow. Dr. Legge, H.M. Medical Inspector of Factories, in his last report, says:

Adequate steam disinfection, provided the bales are opened and the horsehair spread out (in which operations, of course, danger is incurred), can give a certain guarantee of the destruction of the anthrax contagion, but if attempts are made to disinfect unopened bales, especially when hydraulically pressed, the steam will not penetrate to the centre.

After careful consideration I would suggest the following precautions for the prevention of the disease, in the hope that they might be found not only successful but practicable:

1. That all workers should wear overalls.
2. That no one with any cut, sore, or abrasion of the skin should be allowed to work unless it can be absolutely protected from contamination.
3. That all workers should wash themselves frequently, and especially before taking food.
4. That all cases of illness, especially if connected with any swelling or boil, should be immediately intimated to the

manager, in order that the disease may be attacked in its earliest stages, and that other workers similarly exposed may be warned of their danger.

5. That the bales should be immediately immersed in water, and that no handling of the raw material be permitted, except in the wet state. This will prevent dust, and the risk of contagion then will only be possible through an abrasion of the skin. I have no faith in the use of fans, respirators, or currents of air. The germ must be killed; by these means it is simply shifted. Unlike other dangerous trades this microbe is wafted on the breeze until it settles, and there awaits—it may be for years—a suitable soil in man or beast in which to grow and develop.

6. That the hair should be boiled—say for thirty minutes—in order to cleanse it, and soften the agglutinated discharges which may contain the germs, and that afterwards steam should be applied for the same time at a pressure of 0.15 atmospheres. If, however, it be desired to effectually disinfect by boiling, without continuing it so long as to destroy the material, it could be accomplished by using a 2 per cent. solution of potassium permanganate, and afterwards bleaching with a 3 per cent. solution of sulphurous acid.

7. That all dust and residue be carefully burned.

I am of opinion that these precautions might be used without encountering any material or industrial difficulties, and that they would afford a complete immunity from the disease.

AN ADDRESS

ON THE

REORGANISATION OF THE BRITISH MEDICAL ASSOCIATION, AND ON CERTAIN PROPOSED ALTERATIONS IN MEDICAL EDUCATION.

Delivered at the Annual Meeting of the Metropolitan Counties Branch of the British Medical Association, June 25th, 1901.

By STEPHEN MACKENZIE, M.D., F.R.C.P.,
President of the Branch.

THE REORGANISATION OF THE ASSOCIATION.

GENTLEMEN,—The present has been an eventful year in the history of the British Medical Association, and we are still in the midst, if not of a constitutional crisis, of a consideration of a remodelling of the Association. The present constitution of the Association, adopted in 1874, is that of a limited liability company, registered under the Companies Act as an Association not for profit. Since 1874 the Association has largely increased, and now has upwards of 18,000 members. It is not surprising that many are of opinion that a constitution that sufficed when the Association was much smaller has now become inadequate. This Branch has already given its adhesion to the general principles of the scheme submitted by the Constitution Committee, and also, with a few modifications, to its details. It is realised no doubt by most that a large number of members are really completely indifferent whether any alterations are made in the constitution of the Association or not. Many also, I daresay, are satisfied with the existing organisation, but there are others desirous of a more perfect form of Government and organisation of an Association of such numbers, which, united and capable of expressing the fully and clearly ascertained views of the majority, ought to be a power in the land in laying before Parliament or public bodies an authoritative expression of the opinions and desires of the great bulk of the profession.

The main principles of the proposed reformation are:

1. The institution of small primary units of organisation.
2. The enrolment of every member of the Association in the local organisations.
3. The appointment of delegates of the primary units of organisation to represent the opinions of the latter, and to take an important part in the management of the Association.

These general principles seem, from the reports of the meetings of Branches, and correspondence in the JOURNAL, to meet with general acceptance. It is in the application of